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ABSTRACT

This report analyzes the major issues discussed at hearings held by the House Subcommittee on Science, Research and Technology on the availability of Japanese scientific and technical information (STI), and outlines the various alternatives for action. The study begins with a discussion of Japan's efforts to coordinate STI, including government efforts to create integrated STI networks and additional efforts to monitor and acquire foreign STI. A discussion of current U.S. efforts to acquire Japanese STI, including selected efforts by federal agencies, the private sector, and university programs, is followed by an analysis of existing barriers to the acquisition and dissemination of this information. The report concludes with a summary of recommendations from the witnesses on the role of the Federal Government, and an overview of legislative activity during 1984. (THC)

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THE AVAILABILITY OF JAPANESE SCIENTIFIC AND TECHNICAL INFORMATION IN THE UNITED STATES

REPORT

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FOR THE

SUBCOMMITTEE ON
SCIENCE, RESEARCH AND TECHNOLOGY

TRANSMITTED TO THE

COMMITTEE ON SCIENCE AND TECHNOLOGY
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LETTER OF TRANSMITTAL

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC, October 18, 1984.

Hon. DON FUQUA,
Chairman, Committee on Science and Technology, U.S. House of Representatives, Washington, DC.

DEAR MR. CHAIRMAN: The following report entitled, "The Availability of Japanese Scientific and Technical Information in the United States," is an analysis of hearings held by the Subcommittee as part of its continuing interest in the issues of innovation and productivity.

The analysis was prepared by Nancy R. Miller, Analyst in Information Science and Technology, Science Policy Research Division, of the Congressional Research Service.

I commend this report to the attention of all Committee Members concerned with our Nation's international competitiveness status in the world.

Sincerely,

DOUG WALGREN,
Chairman, Subcommittee on Science, Research and Technology.

LETTER OF SUBMITTAL

CONGRESSIONAL RESEARCH SERVICE,
THE LIBRARY OF CONGRESS,
October 16, 1984.

Hon. DOUG WALGREN,
Chairman, Subcommittee on Science, Research and Technology, Committee on Science and Technology, House of Representatives, Washington, DC.

DEAR MR. CHAIRMAN: I am pleased to submit this report entitled "The Availability of Japanese Scientific and Technical Information in the United States" prepared at the request of the Subcommittee on Science, Research and Technology.

This report analyzes the major issues discussed at the subcommittee's hearings on the availability of Japanese scientific and technical information (STI) and outlines the various alternatives for action. Included in the study is a description of Japan's efforts to coordinate STI. This is followed by a discussion of current U.S. efforts to access Japanese STI as well as an analysis of existing barriers to acquiring and disseminating these data. The report concludes with a summary of recommendations from the witnesses on the role of the Federal Government, and an overview of legislative activity during 1984.

The study was prepared by Nancy R. Miller, Analyst in Information Science and Technology, Science Policy Research Division.

We hope that this report will serve the needs of your committee and appreciate the opportunity to perform this challenging assignment.

Sincerely,

GILBERT GUDE, *Director.*

THE AVAILABILITY OF JAPANESE SCIENTIFIC AND TECHNICAL INFORMATION IN THE UNITED STATES

Report prepared at the request of the Subcommittee on Science, Research and Technology, Committee on Science and Technology, U.S. House of Representatives

Nancy R. Miller, Analyst in Information Science and Technology, Science Policy Research Division, October 1984

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I. INTRODUCTION

Japanese advances in science and technology over the past decade are well-documented. Progress in such areas as computers, semiconductors, fiber optics, and robotics have contributed to Japan's competitive status in the world markets for high technology products. For example, Japan has attained a positive balance in bilateral trade in high technology products with the United States; Japan moved from a deficit in these products in 1968 to a surplus position of nearly $3 billion in 1980.[1] Further, in recent years, Japan has increased spending on research and development (R&D). In 1981, Japanese R&D spending exceeded $26 billion or four times what was spent annually ten years ago. The 1981 figures approximate U.S. figures on a per capita basis.[2]

The growth of high technology products and R&D spending has been accompanied by a significant increase in Japanese scientific and technical information (STI). Experts estimate that in Japan there are currently some 9000 scientific and technical journals. Both the public and private sectors in Japan have been active in coordinating domestic STI and in acquiring foreign scientific and technical literature. For example, in recent years the Japanese government has intensified efforts to establish efficient STI networks to ensure the smooth flow of domestic and foreign data between Japanese researchers. In addition, the overseas offices of Japanese trading companies routinely have monitored scientific and technological developments and collected foreign literature.

Japan's efforts to coordinate STI activities both domestically and internationally have outpaced similar efforts in the United States. Given the significant strides made in Japanese science and technology, a number of individuals feel that the United States needs to reverse that situation to remain competitive. According to William F. Finan, former special assistant to the Department of Commerce's Under Secretary for International Trade, "We have not taken advantage of the high-technology information that is available in Japan. If we fail to act, we are condemning ourselves to fall further and further behind the Japanese."[3]

In response to these concerns, the House Science and Technology Subcommittee on Science, Research and Technology held two days of hearings in March 1984 on the availability of Japanese scientific and technical literature in the United States. The Subcommittee heard testimony from representatives of industry, academia, and

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[1] Prepared statement of Bruce Merrifield for the Hearings on The Availability of Japanese Scientific and Technical Information in the United States. U.S. House. Committee on Science and Technology. Subcommittee on Science, Research and Technology. Mar. 6-7, 1984. Washington, U.S. Govt. Print. Off., 1984. (98th Congress, 2d session). [Hereinafter referred to as the Hearings]. p. 154.

[2] America Starts Looking over Japan's Shoulder. Business Week, Feb. 13, 1984. p. 136.

[3] America Starts Looking over Japan's Shoulder, p. 136.

the Government[4] to determine the current level of activity in the United States and to assess what role, if any, the Federal government should play to increase access to Japanese STI. In his opening statement, Subcommittee Chairman Doug Walgren emphasized: [5]

> The collection, analysis, translation, and application of scientific and technical information from all over the world by the Japanese have played a major role in making their economy the second largest in the world. . . . In contrast, the United States does not have any focused system that Government and industry can use to explore technical developments in other nations. . . . The purpose of these hearings is to raise the level of awareness in this country about Japanese scientific and technical information, and to discuss what appropriate actions are needed to create the acquisition, the translation, and the utilization of this information on a level that will meet American needs.

[4] Witnesses included: Justin Bloom, President, Technology International Inc., and former Science Counselor, U.S. Embassy, Tokyo; Herbert B. Landau, President, Engineering Information Inc.; Anthony Polsky, President, Cathay Counsellors Groups Inc., accompanied by Dr. Toshio G. Tsukahira, Associate; James Bartholomew, Associate Professor, Chio State University; Eleanor Westney, Acting Director, Japan Science and Technology Program, Massachusetts Institute of Technology; Susan Goldman, Research Scientist, Courant Institute of Mathematical Science, New York University; Bruce Merrifield, Assistant Secretary for Productivity, Technology and Innovation, Department of Commerce, accompanied by George Mu, Deputy Director, Office of Japan, International Trade Administration, Department of Commerce; David Shonyo, Acting Director of International Affairs, National Technical Information Service, Department of Commerce, accompanied by Joseph E. Caponio, Director, National Technical Information Service; John Alic, Office of Technology Assessment, accompanied by Martha Caldwell Harris; Peter Marino, Deputy Director, Foreign Broadcast Information Service, accompanied by Cyril P. Braegelman, Chief, Near East/Asia Division; Samuel K. Coleman, Associate Director for Office and Program Development, North Carolina-Japan Center; Clark E. Johnson, Jr., Chairman of the Board, Vertimag Systems Corporation; Michael Majcher, Xerox Corporation; Robert W. Gibson, Head Library Department, General Motors Research Labs; James V. Seals, Director International Programs, Chemical Abstracts Service; and William S. Budington, Exective Director, The John Crerar Library.

[5] Opening remarks of the Honorable Doug Walgren for the Hearings, p. 1-2.

II. JAPAN'S EFFORTS TO COORDINATE STI

A. Domestic Structure

Since World War II, Japan has viewed advances in science and technology as vital to the nation's economic growth. The Japanese government has promoted policies that support domestic industries and encourage the acquisition and development of foreign technologies. The success of these efforts is evident in Japan's current status as a leading world economic power. In recent years, however, the Japanese increasingly have been generating their own technologies. By 1977, Japan was supplying one-eighth of the world's technology-intensive exports.[6] Today, Japan's technology focus has shifted from imitative to creative technology. Targeted national programs—such as fifth generation computers, supercomputers, robotics, and biotechnology—highlight Japan's intent to surpass existing technology to become the world's leader in several high technology fields.

A fundamental component of Japanese programs in science and technology has been the active effort to monitor and acquire foreign STI and to coordinate it with domestic scientific and technical literature. The government's direct support of STI began almost 30 years ago with the founding of the Japan Information Center of Science and Technology (JICST). Since that time, both government and industry have increased their efforts to collect and disseminate foreign and domestic STI. With the continuing rapid changes in science and technology, timely access to STI is likely to become even more critical in the future for Japanese scientists and researchers.

1. GOVERNMENT EFFORTS TO CREATE INTEGRATED STI NETWORKS

Efforts to ensure the smooth flow of scientific and technical literature to researchers and organizations began in 1957 when the Science and Technology Agency, a part of the the Prime Minister's Office, formed JICST. According to the law which established JICST, the Center would: collect and process worldwide scientific information; disseminate this information rapidly to organizations and individuals; and encourage scientific documentation efforts of organizations.[7]

As the amount of scientific and technical data increased, the government explored methods to build a more effective STI network. In October 1969, the Science and Technology Council of the Prime Minister's Office issued a report which proposed the development of a National Information System for Science and Technology

[6] Lynn, Leonard. Japanese Technology: Successes and Strategies. Current History, v. 82, Nov. 1983. p. 366.

[7] Gibson, Robert W., and Barbara K. Kunkel. Japanese Information Network and Bibliographic Control. Special Libraries, v. 71, Mar. 1980: 156–157.

(NIST). According to the study, NIST would strengthen and coordinate the functions of existing information centers.[8]

Several years later, the Japanese government formed a "Standing Committee for Information in Science and Technology" to revise and redefine NIST. Although the committee concentrated on several themes, the members stressed the need for computerization as well as the need for expanding JICST to serve as the lead organization for collecting, processing, and disseminating worldwide scientific and technical data.[9] Another report, issued in August 1974, detailed a more concrete NIST plan. According to the study, the main elements of the NIST organization would include:[10]

A central organ, JICST, to coordinate the activities of the centers which contribute to the program;

Specialized information centers to collect and process information in specific subject fields;

Data centers to collect and store numerical data derived from experiments and scientific research;

Regional service centers to disseminate information in regional areas such as cities and industrial complexes; and

A clearinghouse to collect and disseminate information on research topics and on-going research and to act as a referral center for STI.

In June 1980, the Science Council of the Ministry of Education, Science, and Culture issued a study on the control of scientific and technical literature. The report, entitled "A New Plan for a Scientific Information System in Japan," proposed another information network encompassing most national universities and research institutions.[11] The report called for the Science Information System (SIS) to: acquire and/or create data bases for national and international bibliographic and indexing services; develop effective on-line retrieval systems; establish more effective channels of communications for academic and scientific data; and improve services of individual libraries through automated data processing.[12]

According to the SIS plan, a science information center with large computer facilities will be built to coordinate all the information-related activities among academic and research institutions. In addition, seven national universities will receive funding to operate large computer centers for cooperative research as well as for developing the SIS; these seven computer centers eventually will function as nodes in the computer network of SIS. The science information center will be responsible for setting policies and standards and for maintaining good relationships with other organiza-

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[8] Gibson and Kunkel, Japanese Information Network and Bibliographic Control, p. 155.

[9] Galinski, Christian. Information and Documentation in Science and Technology in Japan. Journal of Information Science, v. 5, Nov. 1982: 69.

[10] Gibson and Kunkel, Japanese Information Network and Bibliographic Control, p. 155-156.

[11] Galinski, Information and Documentation in Science and Technology in Japan, p. 70; and Morita, Ichiko. Information Networks in Japan. In Proceedings of the ASIS Annual Meeting, 1982. White Plains, New York, Knowledge Industry Publications, 1982. p. 207-208.

[12] Gillmor, Reginald B., and Richard J. Samuels, ed. Japanese Scientific and Technical Information in the United States. (Proceedings of a Workshop at the Massachusetts Institute of Technology, Jan. 1983; sponsored by the U.S. Department of State and the National Technical Information Service). Washington, NTIS, 1983: 29.

tions such as JICST. The SIS, along with NIST, will provide a comprehensive science information service to Japanese researchers.[13]

Today, JICST remains the core of Japanese STI networking efforts. The Center currently collects 10,000 foreign and domestic journals as well as technical reports, conference presentations, and patents. Since only 41 percent of the journals acquired are Japanese, JICST emphasizes collecting foreign scientific and technical periodicals. The publications are scanned, processed, and abstracted by over 5,000 scientists and engineers engaged in research throughout Japan.[14] The Center also has produced its own on-line information computer system called JOIS (JICTS Online Information System). In addition, JICST offers computer access to foreign data bases such as the ones maintained by Chemical Abstracts Service and the National Library of Medicine.[15]

The Japan Patent Office also has played a valuable role in the area of scientific and technical information. In 1971, that agency, with the support of the Japan Institute of Invention and Innovation, founded the Japan Patent Information Center (JAPATIC). JAPATIC is responsible for collecting, processing, and abstracting all relevant patent data. Since 1979, JAPATIC has been operating PATOLIS (Patent Data Online Retrieval System). The system contains information on approximately 400,000 national and foreign patents. In addition, the Japan Institute of Invention and Innovation publishes—in cooperation with the Japan Patent Office—several periodicals containing the data of all Japanese and of most foreign patents.[16]

Other Japanese organizations which focus on scientific and technical information include: Japanese Medical Abstracts Society; Medical Information System Development Center; International Medical Information Center; Japan Pharmaceutical Information Center; Society of Automotive Engineers of Japan; Japan Association for International Chemical Information; Japan Atomic Energy Research Institutes Nuclear Data Center; Japan Science Foundation; and the Railway Technical Research Institute.[17]

2. ADDITIONAL EFFORTS TO MONITOR AND ACQUIRE FOREIGN STI

For many years, Japanese trading companies have engaged in active efforts to monitor foreign scientific and technological developments and to acquire related literature. For example, as long ago as the 1920s, Mitsubishi established subsidiaries in Europe to locate technologies that might be introduced into Japan. Today, each of the six largest trading companies has over 100 overseas offices. Japanese trade associations also monitor foreign developments to keep their members informed. Two associations, the Japan Iron and Steel Federation and the Japan Industrial Robot Association, routinely collect foreign technical journals, conference proceedings, and patents as well as abstract them and provide

[13] Gillmor and Samuels, Japanese Scientific and Technical Information in the United States, p. 29, 32-33.
[14] Prepared statement of Robert W. Gibson for the Hearings, p. 348.
[15] Galinski, Information and Documentation in Science and Technology in Japan, p. 71.
[16] Galinski, Information and Documentation in Science and Technology in Japan, p. 73.
[17] Galinski, Information and Documentation in Science and Technology in Japan, p. 74.

translations.[18] In addition, employees of Japanese companies stationed abroad reportedly monitor patents, hire market researchers to conduct studies, and attend scientific meetings and trade shows.[19]

3. GROWTH OF JAPANESE STI

Japan currently ranks third in the world in total spending for scientific and technical research as well as supporting the world's third largest research labor force.[20]

Japan's increased emphasis on R&D has been accompanied by a dramatic growth in scientific and technical literature. Today Japan is one of the leading nations in publishing scientific and technical journals. An in-depth study launched several years ago by the General Motors Research Laboratories Library revealed that there were approximately 9100 pertinent Japanese journals that focused on science and technology. Of the 9100 titles, slightly less than one-fourth were published in English, while three-fourths were published in Japanese. The largest portion of the periodicals were published in the applied sciences (45 percent), followed by agricultural sciences (20 percent), medical sciences (18 percent), and natural sciences (17 percent). Only nineteen percent of Japanese scientific and technical journals were covered by Western indexing and abstracting sources. Of the 81 percent not covered by Western indexes and abstracts, approximately 14 percent was printed in English and about 86 percent in Japanese.[21]

In addition to the journal literature, Japan has a substantial body of technical report literature. Technical reports in Japan are published primarily as products of research institutions. As a result, most of this literature becomes the property of either the governmental or corporate sponsoring body. Unlike periodical literature, there is no government-wide information data base or control system to which the technical community contributes the results of research.[22]

Patenting activity also has grown substantially. Although Japan traditionally has licensed technology from abroad, researchers increasingly are developing their own technology. Considering only contracts entered into since 1972, Japan is a net exporter of technology; however, Japan still pays more to license technology from abroad than it receives in license fees and royalties for technology it develops.[23] Still, the Japanese filing rate of patent applications has grown significantly. In addition, the Japanese file more patent applications in the United States than American companies file in

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[18] Lynn, Japanese Technology: Successes and Strategies, p. 367.

[19] Pollack, Andrew. Japan Technology Monitored by Worried U.S. Competitors. New York Times, May 7, 1984: D12.

[20] Prepared statement of Robert W. Gibson for the Hearings, p. 346.

[21] Prepared statement of Robert W. Gibson for the Hearings, p. 347. In contrast to Gibson's findings, one witness claimed that "a wealth of information" is available to the United States through subscriptions to English language journals and newspapers. The Japanese government also issues English translations of technical brochures, white papers, and other analytical material. From prepared statement of Justin L. Bloom for the Hearings, p. 10.

[22] Prepared statement of Robert W. Gibson for the Hearings, p. 348.

[23] Pollack, Andrew. The Patent as Trade Barrier. New York Times, July 5, 1984: D2.

Japan. According to an expert quoted in a recent *New York Times* article, "During the next five years, we're [the United States] going to have fewer and fewer properties to license. The Japanese are going to have more and more properties to license."[24]

[24] Pollack, The Patent as Trade Barrier, p. D2.

III. U.S. EFFORTS TO ACQUIRE JAPANESE STI

Japanese efforts to monitor and acquire U.S. technology and scientific and technical data have outpaced comparable efforts in the United States. Although several Federal agencies have programs to acquire, translate, and disseminate Japanese STI, their efforts primarily support agency needs and are uncoordinated. To date, abstracting and indexing firms have engaged in the most systematic attempts to acquire Japanese STI. These services, however, are not comprehensive and are confined to Japanese journals published primarily in Western languages.

Some observers attribute the inattention to Japanese STI to the tradition of U.S. leadership in science and technology and the "not-invented-here" syndrome. Increasingly, however, officials in the public and private sectors are concerned that the failure to monitor Japanese scientific and technological advances has placed the United States at a disadvantage. For example, a study by the American Chamber of Commerce's Tokyo office recently claimed that U.S. technology was rapidly being overtaken by the Japanese in 12 areas. The report prompted the U.S. embassy to recommend that "* * * the federal government imitate Japan's massive system for gathering technological information and make it available to U.S. companies."[25] In addition, one indicator of the amount of scientific research in a nation is the quantity of scientific literature. Although in 1980, U.S. scientists and engineers were responsible for 37 percent of the world's influential scientific and technical literature, from 1972 to 1980 the U.S. proportion dropped in six out of eight fields. The largest decreases occurred in mathematics and engineering.[26]

In response to these developments, some private organizations are establishing programs to improve surveillance of Japanese technology and scientific and technical literature. For example, the American Electronics Association has received financial assistance from the Commerce Department to open a new office in Tokyo. Among other duties, the office will collect and disseminate technical data. Several universities have initiated programs which focus on Japanese language instruction for scientists and engineers as well as translation projects and academic exchanges. In addition, two private sector firms have considered offering abstracting and indexing services for Japanese STI.

A. Selected Efforts by Federal Agencies

The Federal government has increased attempts in recent years to acquire and disseminate Japanese STI. In 1980, Congress appro-

[25] America Starts Looking over Japan's Shoulder, p. 136.
[26] U.S. National Science Foundation. International Science and Technology Data Update. Washington, NSF, 1984: 21.

priated funds to the National Technical Information Service (NTIS) to begin the Foreign Technology Acquisition (FTA) program. Last year, the Foreign Broadcast Information Service (FBIS) began publishing a report focused specifically on Japanese science and technology. The Department of Commerce, along with the National Science Foundation (NSF), recently sponsored a pilot program to examine Japanese advances in four high technology areas as well as the Japanese scientific and technical literature in each sector. In addition, other Federal agencies acquire Japanese STI directly as well as through formal scientific and technical agreements with Japan. Despite these activities, Federal efforts to collect and disseminate Japanese STI largely remain fragmented and focused primarily on agency needs.

1. NATIONAL TECHNICAL INFORMATION SERVICE

The National Technical Information Service, part of the Department of Commerce, serves as a central source of scientific and technical information resulting from research undertaken by and for the U.S. government. All reports in the NTIS collection are available to the public. Since NTIS is required by law to be self-supporting, the agency charges its users for reports to recover operating costs.

NTIS began acquiring foreign scientific and technical reports in 1981 through its Foreign Technology Acquisition Program. The concept for the program originated during the 1978–1979 Domestic Policy Review on Industrial Innovation. In the report by the Advisory Committee on Industrial Innovation, the panel on patent and information policy observed that American industry needs improved access to foreign technical data. To respond to this problem, the panel set forth several policy options for Federal action, including expanding the collection and distribution of foreign technical data. The group specifically recommended that the Federal government negotiate with foreign countries to exchange technical reports of government-sponsored R&D activities as well as collect and disseminate information about such foreign reports.[27]

Congress responded to this suggestion by appropriating $750,000 to NTIS in the FY81 budget to launch the FTA program. NTIS received $500,000 and $250,000, respectively in the FY82 and FY83 budget appropriations. The program became self-supporting in FY84.[28]

The objectives of the FTA program are to: indentify industry's technical information needs; seek and acquire foreign documents of interest to U.S. industry; translate into English the most important foreign language materials; and disseminate information to U.S. industry.[29] NTIS acquires material by working with foreign cooperating organizations which handle NTIS sales within their own nations. The cooperating organization in Japan is the Mitsubishi Research Institute which has contracted with one individual to identify potential sources of relevant technical reports. To date, NTIS

[27] U.S. Department of Commerce. Advisory Committee on Industrial Innovation: Final Report. Washington, U.S. Govt. Print. Off., 1979. p. 127, 129.
[28] Prepared statement of David Shonyo for the Hearings, p. 169.
[29] Prepared statement of David Shonyo for the Hearings, p. 169.

has completed acquisition arrangements with 20 Japanese organizations including the Agency for Industrial Science and Technology, the research arm of the Ministry of International Trade and Industry.[30]

Japanese technical documents represent about five percent of the total number of foreign titles listed in the NTIS data base. The average sale of Japanese documents is 12 copies for each title. This compares with an average of about five copies per title of all foreign documents in the NTIS collection. Although NTIS has potential access to a larger number of Japanese technical reports, the actual number that FTA can accept is restricted by the language barrier.[31]

2. FOREIGN BROADCAST INFORMATION SERVICE

Since 1941, the Foreign Broadcast Information service has monitored foreign media on behalf of the U.S. government. In 1967, FBIS expanded its mission to include translating foreign publications for Federal agencies. FBIS staff in overseas field installations monitor foreign radio and television broadcasts, press agency transmissions, and publications for information which supports current research and analysis. Selected items are wirefiled to U.S. embassies and military commands worldwide as well as to FBIS headquarters in Washington. FBIS headquarters publishes the bulk of the field-monitored material within one to two days in the eight regional volumes of the "FBIS Daily Report." [32]

FBIS headquarters also has foreign document officers who regularly scan foreign newspapers, periodicals, and other publications for material of interest to the Federal government. Articles identified as significant are translated by the Joint Publications Research Service (JPRS), a component of FBIS which employs approximately 1000 independent contractors. The translations are organized into serial reports and are distributed free of charge to a wide range of government users. The public can purchase many of the reports through NTIS. The staff of JPRS also translates foreign documents for other U.S. government agencies on cost-reimbursable basis.[33]

With the increase in demand for Japanese STI, FBIS began publishing in 1983 a serial report which focuses exclusively on Japanese science and technology. To assemble the *Japan Report: Science and Technology*, JPRS staff scan and select articles from approximately 250 current Japanese scientific and technical publications. Freelance translators under contract to JPRS then translate the articles. Since all of the material in the *Japan Report: Science and Technology* is compiled from Japanese copyrighted material, the document is restricted to official government use only.[34]

The amount of material published in the Report has increased from 2000 pages annually to 6000 pages currently. The publication

[30] Telephone conversation with David Shonyo, NTIS, August 24, 1984.
[31] Prepared statement of David Shonyo for the Hearings, p. 173, 174.
[32] U.S. Foreign Broadcast Information Service. Fact Sheet: Foreign Broadcast Information and Joint Publications Research Service, June 1, 1983.
[33] U.S. Foreign Broadcast Information Service, Fact Sheet.
[34] Telephone conversation with Cyril Braegelman, FBIS, Aug. 22, 1984.

covers a variety of topics such as biotechnology, genetic engineering, computers, nuclear energy, electronics, space and aviation, telecommunications, and new materials. A FBIS official has cited the lack of qualified translators and the vast amount of Japanese scientific technical literature as the two major difficulties in compiling the *Japan Report: Science and Technology*.[35]

To assist Federal agencies in monitoring what foreign publications have been translated into English, FBIS maintains the Consolidated Translation Survey (CTS). The CTS is an automated index which includes records of unclassified items translated or in the process of translation by Federal agencies. One FBIS official estimated that the CTS saved Federal agencies approximately $1.9 million in 1983 in translation costs. No data exist on either the number of or requests for Japanese translations.[36]

3. COMMERCE DEPARTMENT/NATIONAL SCIENCE FOUNDATION PROJECT

The Office of Japan in the Commerce Department's International Trade Administration—along with the National Science Foundation—currently is sponsoring a one-year pilot project to analyze Japanese advances in four high technology areas. Panels comprised of experts from industry, the scientific community, and government are relying on data from Japanese documents to assess the areas of computer science, robotics, nonsilicon based microelectronics, and biotechnology. The contractor to the project, Science Applications Inc., is responsible for selecting, translating, and disseminating the Japanese STI to the appropriate panels.[37]

At the end of the project, each panel will issue a report outlining the current status and future trends of Japanese R&D efforts in these sectors. In addition, the contractor will submit a special report on the related Japanese scientific and technical literature. The objective of the Japanese STI study is to form a basis for a broader survey of Japanese scientific and technical literature and to suggest ways in which U.S. companies can access these sources.[38]

4. EFFORTS BY OTHER FEDERAL AGENCIES

At the 1983 Workshop on Japanese Scientific and Technical Information in the United States held at the Massachusetts Institute of Technology (MIT Workshop), representatives from other Federal agencies described their efforts to acquire Japanese STI. Some of the more significant activities are summarized below:[39]

Office of Naval Research (ONR): In 1975, the ONR established a field office in Tokyo. Today the office is staffed by a small group of rotating university, government, and American scientists who monitor developments in most of the fundamen-

[35] Oral testimony presented by Cyril Braegelman at the Hearings, p. 278–279.
[36] Oral testimony presented by Cyril Braegelman at the Hearings, p. 278.
[37] Prepared statement of George Mu for the Hearings, p. 183–184, and telephone conversation with George Mu, Sept. 28, 1984.
[38] Prepared statement of George Mu for the Hearings, p. 184–185.
[39] Gillmor and Samuels, Japanese Scientific and Technical Information in the United States, p. 67–81; and telephone conversation with Carolyn Tilley, National Library of Medicine, Aug. 30, 1984. For additional information on library collections and collection development of Japanese STI in the United States, see the Gillmor and Samuels report, p. 84–132.

tal scientific disciplines. Since 1976, the Tokyo office has been publishing a quarterly periodical entitled *Scientific Bulletin: Department of the Navy Office of Naval Research Far East.*

U.S. Army Science and Technology Center, Far East Operations (STCFEO): The Department of the Army established STCFEO in Japan as one of two overseas offices of the Foreign Science and Technology Center. The staff of STCFEO currently monitors scientific and technical developments and collects information from governmental R&D agencies, private research institutions, industry, universities, and trade fairs in supports of U.S. Army needs.

National Library of Medicine (NLM): NLM collects 22,000 journals of which six percent are Japanese. Of the titles indexed in NLM's online data base, approximately four percent are Japanese. NLM has long-standing relationships with Japanese organizations, including a quid pro quo agreement with JICST. In exchange for the tapes of the NLM data base files, JICST provides indexing assistance for Japanese medical literature.

In addition to the above programs, the governments of the United States and Japan maintain a network of cooperative scientific and technical agreements, several of which have been in effect for more than 20 years. These agreements provide for meetings and seminars, joint projects, the exchange of scientists, as well as information exchange. Today, there are 13 major U.S.-Japan scientific and technical programs.[40]

One of the largest programs in terms of exchange of scientists is the U.S.-Japan Cooperative Science Program. The National Science Foundation—the agency responsible for administering this protocol—has two representatives in the American Embassy in Tokyo who assist in coordinating the exchange of scientists between the United States and Japan. From April 1982 to March 1983, 269 American scientists traveled to Japan under this agreement, while 332 Japanese came to United States. The data gathered by the scientists participating in this exchange program frequently appear in scientific publications. Last year, some 275 publications resulted from this bilateral scientific agreement.[41]

B. Selected Efforts by the Private Sector

Abstracting and indexing firms generally have made the most systematic attempts to cover foreign STI, including literature from Japan. These efforts, however—like those of Federal agencies—are limited to specific subject areas to serve a specific clientele. In addition, abstracting and indexing firms largely include only those Japanese journals published in English. Several large corporations also are involved in monitoring Japanese scientific and technological developments and acquiring Japanese STI for their own use.

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[40] Prepared statement of Justin Bloom for the Hearings, p. 9; and interviews with Arthur Corte and Pam Smith, State Department, July 27, 1984.

[41] Telephone conversation with Charles Wallace, NSF, Aug. 22, 1984.

1. SELECTED ABSTRACTING AND INDEXING SERVICES

a. Chemical Abstracts Service

Chemical Abstracts Service (CAS) is an operating division of the American Chemical Society, a Congressionally chartered non-profit educational and scientific organization. Since 1907, CAS has been abstracting and indexing literature in the fields of chemistry and chemical engineering. Today, CAS monitors more than 12,000 scientific and technical periodicals from 150 nations as well as patent applications issued by 26 nations and two international bodies, conference proceedings, dissertations, reports, and books. The most comprehensive publication is *Chemical Abstracts* which has subscribers in over 100 countries. Since 1967, Chemical Abstracts has operated a computer search service that permits international online searching of much of the content of *Chemical Abstracts.*[42]

Over the past two decades, CAS has abstracted an increasing amount of Japanese scientific literature--including journal articles, conference papers, and reports—as well as Japanese patents. For example, the number of abstracts of Japanese papers appearing in *Chemical Abstracts* grew from 10,400 in 1961 to 39,500 in 1983.[43] From 1979 to 1983, the number of Japanese periodicals indexed by CAS grew from 1401 to 1548, an increase of 10.5 percent.[44]

Chemical Abstracts Service works closely with the Japan Association for International Chemical Information (JAICI). The Japanese chemical industry and scientific societies organized JAICI specifically to cooperate with the American Chemical Society on matters related to chemical information exchange. In addition, JAICI assists the American Chemical Society in marketing and distributing CAS services in Japan.[45]

b. Engineering Information Inc.

Engineering Information Inc. is a private, nonprofit abstracting and indexing service that has covered international engineering literature for 100 years. Through either printed indexes or automated data bases, individuals can access information in all disciplines of engineering in addition to areas such as metallurgy, biotechnology, and industrial management. Engineering Information currently monitors approximately 350 publications—primarily periodicals—from over 40 countries. This coverage includes some 130 journals and conference proceedings from Japan. At present only three to five percent of the 215,000 records added annually to the Engineering Information data base originate from Japan. Engineering Information officials attribute this low percentage to the high costs associated with acquiring and translating Japanese scientific and technical literature.[46]

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[42] Prepared statement of James V. Seals for the Hearings, p. 360–361.
[43] Prepared statement of James V. Seals for the Hearings, p. 362.
[44] Prepared statement of Robert W. Gibson for the Hearings, p. 352.
[45] Prepared statement of James V. Seals for the Hearings, p. 364.
[46] Gillmor and Samuels, Japanese Scientific and Technical Literature in the United States, p. 137–139.

c. Biosciences Information Service (BIOSIS)

Biosciences Information Services is a nonprofit abstracting and indexing service which provides comprehensive coverage in areas of life sciences. Statistics compiled for 1982 indicated that BIOSIS monitored approximately 9000 publications and about 1500 books to abstract and index some 315,000 items. Of this coverage, 17,000 items or 6.37 percent were from Japan compared to 23 percent from the United States, 7.7 percent from the United Kingdom, and 7.4 percent from the Soviet Union.[47]

2. U.S. INDUSTRY INVOLVEMENT

The extent of industry involvement in acquiring and translating Japanese STI is difficult to determine since most activity is proprietary in nature. According to press accounts, a few large corporations, such as RCA, 3M, IBM, and Corning Glass have established their own information collection systems through sales representatives or their partners in joint ventures.[48] Other companies—including Burroughs, Eastman Kodak, GTE Microcircuits, and TRW—are moving employees to Japan or are hiring people to track Japanese developments.[49] Absent from these listings are the names of smaller companies which likely cannot afford such activities. During the hearings one witness emphasized that " * * * the medium-scale and smaller-scale companies * * * will be at a comparative disadvantage." [50]

In January 1984, the American Electronics Association received a two-year $500,000 grant from the Department of Commerce to assist the organization in opening an office in Tokyo. The primary reason for the move is to improve access to the Japanese market for U.S. electronic firms. To achieve this objective, the staff of the Tokyo office will routinely collect and disseminate relevant technical data.[51]

In 1983, the American Chamber of Commerce in Japan formed a high technology subcommittee to keep members informed on developments in the field. In a statement the subcommittee characterized Japanese data gathering techniques regarding U.S. technological developments as highly advanced. By contrast, the approach of the U.S. government and industry is fragmented and often duplicative. Further, most American companies with business interests or employees in Japan do not have the resources necessary to monitor Japanese scientific and technological developments. According to the statement: [52]

> * * * our national ability to monitor and understand emerging Japanese commercial technologies of potentially great significance, in a timely manner, is not what it should be * * * it is the ability to monitor and understand technological events

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[47] Gillmor and Samuels, Japanese Scientific and Technical Literature in the United States, p. 134.
[48] America Starts Looking over Japan's Shoulder, p. 140.
[49] Pollack, Japan Technology Monitored by Worried U.S. Competitors, D12.
[50] Oral testimony presented by Eleanor Westney at the Hearings, p. 99.
[51] Business Groups Urges Close U.S. Eye on Japanese Move to Open Their Market. Electronics, v. 57, June 14, 1984: 92.
[52] American Chamber of Commerce in Japan. Subcommittee on High Technology Trade Promotion. Statement, Sept. 19, 1983.

taking place in Japan that is of vital importance to our continued competitiveness as a society.

3. PROPOSED SERVICES

Two private organizations have explored the possibility of offering abstracting and indexing services to supply greater access to Japanese scientific and technical literature. For several months, Engineering Information Inc. has considered providing a "Japanese Awareness Service" (JAS) in early 1985 if 20 subscribers signed for the service by September 1984. According to the proposed plans, the JAS would allow subscribers to access citations to articles in 1000 technical periodicals published in Japan as well as 70,000 Japanese papers. Charter subscribers would pay $45,000 per year for full-service coverage (1,000 periodicals and 70,000 papers) and $24,000 for partial coverage (500 periodicals and 35,000 papers). Engineering Information officials, however, have decided not to proceed with JAS because an insufficient number of potential subscribers expressed interest in the service.[53]

The second proposed service is a new abstracting and indexing company in Pennsylvania called the Japanese Technical Information Service (JTIS). By the end of 1984, JTIS plans to begin publishing a monthly abstract journal containing information from several hundred Japanese technical and business periodicals as well as technical reports, government documents, and conference proceedings. JTIS anticipates publishing some 65,000 abstracts per year. The charge for an annual subscription to the monthly journal will be approximately $5,000. In addition, JTIS intends to offer an on-demand translation service.[54]

C. University Programs

In recent years, several universities have responded to the advances in Japanese science and technology by establishing special study programs. The programs concentrate on Japanese language instruction as well as technical translation projects and academic exchanges.

1. MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)

The MIT-Japan Science and Technology Program was initiated in 1981 to educate American scientists and engineers about Japan. The program receives funding from government and corporate sponsors to promote activities such as conferences and workshops on topics related to Japanese science and technology. A key focus of the program is a one-year internship for MIT students in Japanese laboratories. Last year, six students participated in the internship program; next year, the same number are expected to rotate through the program. Another 40 students have expressed interest in participating in the future.[55]

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[53] Engineering Information Inc. Proposal for an Awareness Service for Japanese Technical Literature (marketing letter). June 1984; and telephone conversation with Mary Berger, Engineering Information Inc., Oct. 4, 1984.

[54] Telephone conversation with Herman Baron, JTIS, Oct. 4, 1984.

[55] Prepared statement of Eleanor Westney for the Hearings, p. 107; and telephone conversation with Alice Peattie, MIT-Japan Science and Technology Program, Aug. 22, 1984.

Although Japanese companies have offered to accommodate more interns, the MIT-Japan Science and Technology Program does not have enough qualified candidates to fill the positions. The difficulty in recruiting more students stems from the lack of funding needed to institute a technical Japanese language program. Since MIT does not have any Japanese language classes, students attend Harvard University for language training. The language classes, however, frequently conflict with the class hours of the required engineering courses at MIT. In addition, the Harvard classes reflect the interest of Harvard students in the humanities rather than in science and technology.[56]

2. NORTH CAROLINA STATE UNIVERSITY

The Japan Center at North Carolina State University was established in 1980 as part of an effort to make the state more attractive to Japanese investors. Since its inception, the Center has stressed Japanese language instruction. By the end of 1983, 66 percent of the 72 students enrolled in Japanese language classes were science and engineering majors. The Center recently began an internship program which places engineering and science students in Japanese firms for one semester; during spring of 1984, two students participated in this program. In addition, the Japan Center serves as a clearinghouse for data related to translating and interpreting, academic exchanges, and Japanese business practices.[57]

3. NEW YORK UNIVERSITY

In 1983, the Courant Institute of Mathematical Sciences at New York University began a Japanese translation project in the areas of computer science. The program is the outgrowth of a recommendation in a report by the Computer Science and Technology Board of the National Research Council. The study proposed that the U.S. government support the establishment of academic centers of expertise on Japanese computing.[58] In response to this recommendation, the National Bureau of Standards, through the National Academy of Sciences, supplied partial funding for the project; this funding, however, has been discontinued.[59]

The program's first efforts have focused on translating the table of contents from the 1982 and 1983 issues of the *Journal of the Information Processing Society of Japan.* The translation project has highlighted two problems in accessing Japanese STI: lack of qualified technical translators; and the difficulty in identifying and acquiring the literature to be translated.[60]

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[56] Prepared statement of Eleanor Westney for the Hearings, p. 107–108; and telephone coversation with Richard J. Samuels, MIT-Japan Science and Technology Program, Sept. 28, 1984.

[57] Prepared statement of Samuel K. Coleman for the Hearings, p. 316–318; and telephone conversation with Samuel K. Coleman, Aug. 21, 1984.

[58] Prepared statement of Susan Goldman for the Hearings, p. 122–123. The report by the National Research Council, *International Developments in Computer Science*, also recommended: continued translation of selected Japanese computer journals, theses, and books under U.S. government sponsorship; and establishment of a program—funded by private organizations or the U.S. government—to send selected Japanese-speaking computer scientists from the United States to Japan as guest workers. See National Academy of Sciences. National Research Council. Computer Science and Technology Board. International Developments in Computer Science. Washington, NTIS, 1982. p. 38.

[59] Telephone conversation with Susan Goldman, New York University, Aug. 22, 1984.

[60] Prepared statement of Susan Goldman for the Hearings, p. 125–130.

In response to the need for more translators with a technical background, New York University recently began a pilot program to teach Japanese to computer science majors. During 1984, there were 34 students in the second term of elementary Japanese; of these, 13 were computer science majors, and five were science and engineering majors.[61]

[61] Prepared statement of Susan Goldman for the Hearings, p. 134–135.

IV. BARRIERS TO ACCESSING JAPANESE STI

Despite these efforts by the public, private, and university communities, some observers assert that there are fundamental barriers to acquiring and disseminating Japanese STI. Experts at the MIT Workshop on Japanese STI as well as witnesses at the hearings before the House Subcommittee on Science, Research and Technology identified several problems that must be resolved before U.S. researchers and companies can fully achieve timely access to data on Japanese scientific and technological advances.

Experts at both the workshop and hearings suggested that the principal underlying barrier to acquiring and disseminating Japanese STI is the lack of awareness of the value of these data—or the view of Japan as technological imitators rather than innovators—in the United States. Among other factors, this attitude makes it difficult to persuade public and private officials to commit financial and human resources necessary to access Japanese scientific and technical information.

On a functional level, experts asserted that the lack of qualified technical translators in the United States creates many difficulties in accessing and utilizing Japanese STI. Other problems derive from the structure of Japanese scientific and technical information as well as the Japanese copyright system.

A. Barriers in the United States

Perhaps the most critical barrier to acquiring, translating, and disseminating Japanese STI in the United States is the lack of awareness of the value of this information. According to William Finan, "We suffer from intellectual arrogance—the outdated feeling that America is preeminent and need not worry seriously about foreign competition." [62] This attitude persists despite the fact that Japan now boasts the world's third largest research establishment and continues to make significant contributions in science and technology.

One recent article suggested that the lack of effective access to Japanese STI may be attributed to this negative attitude on the part of Americans rather than any specific attempts by Japan to restrict access to their data.[63] For example, in his testimony, James V. Seals stated that he was not aware of any restrictions imposed by the Japanese on access to the JICST online information system. In order to use the system, however, an American user "* * * must be aware that the service exists, know how to access the service through the public value-added networks, have computer terminals capable of handling the Japanese character set, and

[62] America Starts Looking over Japan's Shoulder, p. 140.
[63] Rowen, Hobart. U.S. Ignoring Available Japanese Technical Information. Washington Post, July 8, 1984: G1, G4.

know how to search in the Japanese language. These constitute a formidable de facto barrier to access by scientists and engineers outside Japan." [64]

The reluctance of U.S. public and private officials to recognize the value of Japanese STI has contributed to a:

Lack of coordination among Federal agencies at both the policy and program levels as well as an unwillingness to commit greater resources to encourage increased activity;

Reluctance of potential and existing abstracting and indexing vendors to commit funds to cover a greater percentage of Japanese scientific and technical materials: and

Reluctance by trade associations and private companies to commit resources to establish technical scanning operations to monitor Japanese scientific and technological advances and related literature.

More importantly, some observers maintain that this attitude has led to reduced emphasis by university officials on Japanese language programs, in particular those directed toward technical students. Lack of qualified technical translators is the "obvious and root cause of most difficulties in the acquisition and utilization of JSTI [Japanese STI]."[65] This conclusion by the participants at the MIT Workshop was reinforced by witnesses at the hearings held by the House Subcommittee on Science, Research and Technology. According to William S. Budington, "Without question, the most significant barrier to effective awareness and utilization of JSTI [Japanese STI] is the scarcity of Japanese language competence teamed with technical and scientific background and understanding."[66]

Translating Japanese scientific and technical literature remains a bottleneck in the operations of most public and private sector organizations with interests in this area. Further, those services that translate Japanese materials often rely on native speakers who are not technical experts. David Shonyo highlighted this problem in his testimony when he estimated that at the current level of operations, the NTIS staff could not translate more than ten Japanese documents into English during the year. Further, although the Joint Publications Research Service of FBIS normally translates material for NTIS, that agency has not been able to accept any Japanese language work from NTIS due to a shortage of translators. Attempts by NTIS to establish a translating service through a procurement contract also have been unsuccessful.[67] In addition to the need for qualified technical translators, witnesses referred to the need for qualified individuals to select the most useful articles and reports. The problem of discriminating between relevant and extraneous material is significant when considering the current volume of Japanese scientific and technical literature.

The shortage of qualified translators is caused in part by the lack of appropriate emphasis on Japanese language programs at universities. According to Susan Goldman:[68]

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[64] Prepared statement of James V. Seals for the Hearings, p. 365.
[65] Gillmor and Samuels, Japanese Scientific and Technical Information in the United States: iii.
[66] Prepared statement of William S. Budington for the Hearings, p. 375.
[67] Prepared statement of David Shonyo for the Hearings, p. 173–174.
[68] Prepared statement of Susan Goldman for the Hearings, p. 121.

> The number of American technical specialists who can use the Japanese language in their professional work is virtually nil. Nevertheless, universities are not working actively to remedy this situation by encouraging their science and engineering students to take Japanese as their foreign language requirement, and by offering programs in technical Japanese.

Goldman also referred to a study compiled several years ago on the number of students enrolled in Japanese language courses. Although the study estimated that 11,000 students were enrolled in Japanese courses at all levels, the greater percentage can be assumed to be in the humanities.[69]

Several witnesses suggested that the only way to keep up with the increasing amount of Japanese STI was to create a new generation of scientific and technical specialists with Japanese language expertise. Since Japanese is one of the more difficult languages to learn, students need to begin Japanese language classes early in their education to give them a basic level of proficiency. For example, at the State Department, Japanese is considered one of the two or three most difficult languages to learn. Language training consists of 44 weeks of full-time instruction at the Foreign Service Institute (FSI) in Washington, followed by a year of total immersion at FSI's branch in Yokohama. In addition, the individual must continue to learn Japanese through on-the-job training while carrying out official duties.[70]

In contrast to the current situation in the United States, Japanese educators stress English language instruction in the curriculum. For many years English has been compulsory in Japan from ninth grade through high school, with at least two additional years at the university level. Further, it has been routine for Japanese academics working in any subject area to translate and circulate all books, papers, and research materials from the United States as they become available.[71]

B. Barriers in Japan

Another barrier to monitoring, acquiring, and disseminating Japanese STI in the United States centers on the structure of the literature in Japan itself. In her testimony at the hearings, Eleanor Westney emphasized:[72]

> Japanese scientific and technical information is much less systematized and readily accessible than is the case in the United States. There are far fewer refereed journals; most Japanese researchers tend to publish in their own university's or company's journal than in national publications.

Further, despite the long-range planning by the Japanese government to create nationwide STI networks, the present state of the networks is far from the stated goal.[73] As a consequence, Japanese

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[69] Prepared statement of Susan Goldman for the Hearings, p. 134.
[70] Prepared statement of Justin L. Bloom for the Hearings, p. 15.
[71] Prepared statement of Susan Goldman for the Hearings, p. 139.
[72] Prepared statement of Eleanor Westney for the Hearings, p. 104.
[73] Gillmor and Samuels, Japanese Scientific and Technical Information in the United States, p. 28.

scientists and engineers generally regard abstracting and indexing services and scientific and technical data bases as inadequate. Instead, Japanese researchers—along with researchers in other nations—tend to rely more heavily on the "invisible college" of informal contacts to obtain information on new research and development.[74]

Experts claim that another problem in acquiring Japanese STI has been the Japanese copyright system. For example, David Shonyo of NTIS explained that according to Japanese copyright law, all government technical reports are copyrighted. Thus, to reproduce technical reports, NTIS must secure a release from each individual author, sponsoring organization, and issuing organization.[75] The Japanese copyright laws also prohibit circulating FBIS' *Japan Report: Science and Technology* to U.S. industry and other potential private sector users. Japanese copyright restrictions dictate that the publication be distributed only to U.S. government users.[76]

[74] Prepared statement of Eleanor Westney for the Hearings, p. 104–105.
[75] Prepared statement of David Shonyo for the Hearings, p. 172.
[76] Telephone conversation with Cyril Braegelman, FBIS, Aug. 22, 1984.

V. POLICY DEBATE

The policy debate concerning Japanese STI centers on two questions: (1) is there a need by U.S. researchers and companies for increased access to Japanese STI; and (2) if so, should the Federal government assume a greater role to assist researchers and private companies in gaining access to these data? Most participants at the hearings and the MIT workshop asserted that not only is there a need for rapid access to Japanese STI, but that there are significant barriers to reaching this goal. They urged the Government to play a greater role to overcome these barriers to achieve effective access to Japanese scientific and technical literature.

This argument is based on the assumption that the demand for Japanese STI currently is not being met. On the other hand, Justin L. Bloom, who participated in both the workshop and hearing, claimed that the nature of demand for Japanese STI is highly uncertain. "At the MIT workshop, essentially everyone there was in the business of collecting or supplying information and we were unable to gauge how much of the demand was being satisfied or whether the information was being used effectively." [77] If the demand exists, the argument can be made to let the marketplace respond to the need. For example, if the proposed JTIS abstracting and indexing service is successful, other private companies may expand or create services to meet the demand for Japanese STI.

Some witnesses likened the current debate over Japanese STI to the U.S. reaction to Russian STI in the post-Sputnik years. During that time, many argued for increased Federal efforts to translate Soviet technical literature and to teach scientists and engineers the Russian language. Yet today, according to Bloom, "* * * the scientific community pays little more attention to the Soviet literature than it does to that of any other country." Bloom asserted that "* * * a cautious and deliberate approach is required to insure that there is an actual need for more information from Japan beyond that currently supplied." [78] Bloom concurred with the participants at the MIT workshop and the hearing that Japan is emerging as a world power in basic research. Therefore, the U.S. should be taking steps—such as teaching a reasonable number of American scientists and engineers the Japanese language—in order to remain aware of current and future Japanese scientific and technological advances.

A. Recommendations From MIT Workshop

In January 1983, the U.S. Department of State and NTIS jointly sponsored the "Workshop on Japanese Scientific and Technical In-

[77] Prepared statement of Justin Bloom for the Hearings, p. 13.
[78] Prepared statement of Justin Bloom for the Hearings, p. 14.

formation" at the Massachusetts Institute of Technology. The sponsors invited representatives from industry, government, and academia who have responsibilities for acquiring and disseminating Japanese STI to discuss the current status of these activities. The participants attempted to identify methods to: coordinate existing activities among the various organizations providing Japanese STI to American users; upgrade the quality and comprehensiveness of the coverage of Japanese STI; and improve the long-term prospects for ensuring access to the results of Japanese research.[79]

The participants discussed several problems—such as lack of coordination among Federal agencies, how to access Japanese technical reports, and the need for more personal contacts with Japanese researchers—related to accessing and utilizing Japanese STI. The workshop concluded, however, that the language problem is the obvious and root cause of most difficulties in accessing Japanese scientific and technical literature. A major element in any long-term solution to the problems in acquiring and utilizing Japanese STI would require investing in programs to produce technically trained individuals with a command of the Japanese language.[80]

For the near term, the participants recommended assessments in the following areas:[81]

Current holdings of Japanese STI in U.S. libraries;

Current coverage of Japanese STI by abstracting and indexing services;

Present utilization of Japanese STI in the United States and user needs;

Analysis of translation capabilities, including availability of qualified translators, education of translators, costs of translation, and a forecast of developments in machine-translation;

The availability of translated materials from public and private sources; and

Options for pursuing and coordinating public and private sector Japanese STI activities as well as the desirability of a centralized facility for coordinating these activities.

Such assessments would provide better and more detailed information for future policy discussions concerning U.S. access to Japanese scientific and technical literature.

B. Role of the Federal Government: Recommendations from the Hearings

In response to concerns about the availability of Japanese STI in the United States, the House Science and Technology Subcommittee on Science, Research and Technology held two days of hearings in March 1984. Experts from industry, academia, and the government presented their views on the difficulties in accessing, trans-

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[79] Gillmor and Samuels, Japanese Scientific and Technical Information in the United States, p. iii. Other conferences and reports that have referred to Japanese STI in the context of broader and/or related issues include: *International Developments in Computer Science* (See note 58); *Industry-to-Industry International Armaments Cooperation, Phase II: Japan* (Department of Defense, Defense Science Board, Washington, 1984); and *U.S.-Japan Technological Exchange Symposium* (Uyehara, Cecil H., ed. Washington, University Press of America, 1982).

[80] Gillmor and Samuels, Japanese Scientific and Technical Information in the United States, p. iii.

[81] Gillmor and Samuels, Japanese Scientific and Technical Information in the United States, p. 164-165.

lating, and disseminating Japanese STI. In addition, they made recommendations about how the U.S. government could expand its role to increase access to this data. These suggestions are summarized below.

1. PRELIMINARY STUDIES

Drawing on the recommendations from the MIT workshop, two witnesses suggested that the Federal government should fund studies assessing the current status of Japanese STI activities in the United States. One witness recommended that a Federal agency—such as NSF or NTIS—conduct a study of the current uses of Japanese STI to determine the value of information already obtained.[82] Another urged the government to fund a major study of the processes by which Japanese STI is gathered and disseminated both in this country and in Japan.[83]

2. LANGUAGE

To increase the number of qualified technical translators, several witnesses strongly recommended funding for Japanese language programs at universities as well as financial aid to students in science and engineering who undertake Japanese language study. In addition to Japanese language instruction, these programs could promote academic exchanges of science and engineering students. One witness suggested that the government revitalize the National Defense Foreign Language Program.[84] Another witness encouraged Federal support of multifaceted programs at university-based centers for U.S.-Japan scientific and technical cooperation. Such programs should focus on language instruction and Japanese studies as well as collecting and translating Japanese STI. To expedite the flow of Japanese STI to the private sector, the centers should be located at universities that have developed cooperative relationships with industry. In addition, these universities must demonstrate a willingness to design Japan-related course offerings to meet the specific needs of students in science and engineering.[85]

3. TRANSLATION SERVICES

One witness recommended Federal support for a program to start a Japanese STI translation service. He described a precedent set by NSF several decades ago when that agency initiated a program to translate Russian physics journals into English; the effort was later taken over by the private sector.[86] Another witness suggested a model established in the late 1950's with Russian technical literature. At that time, the Commerce Department's Office of Technical Services and the Special Library Association's (SLA) Translations Center [87] at the John Crerar Library began a joint

[82] Prepared statement of Justin Bloom for the Hearings, p. 18.
[83] Prepared statement of Eleanor Westney for the Hearings, p. 109.
[84] Prepared statement of Eleanor Westney for the Hearings, p. 108.
[85] Prepared statement of Samuel K. Coleman for the Hearings, p. 322.
[86] Prepared statement of Clark E. Johnson for the Hearings, p. 330.
[87] The John Crerar Library continues to operate the National Translation Center (the name was changed after SLA relinquished its interests) as a depository and clearinghouse for unpub-

Continued

project to acquire, publicize, and disseminate translations from government and private sources.[88]

4. JAPANESE STI COLLECTIONS IN LIBRARIES

Several witnesses urged the government to provide support to libraries in order to strengthen collections of Japanese scientific and technical literature. One witness stated that a thorough inventory of Japanese STI holdings in U.S. libraries should be conducted. Titles that are lacking could then be obtained through grant support to one or several depository libraries. This would follow the precedent set in the 1950s when NSF funds ensured access at the Center for Research Libraries to foreign chemical and biological literature.[89] Another witness recommended Federal funding assistance for libraries with Japanese language collections as well as for engineering and science libraries in universities.[90] To centralize Japanese STI materials, one witness stated that the government should support efforts to maintain the holdings of the major portion of Japanese scientific and technical periodicals in one U.S. library.[91]

5. INCREASED RESPONSIBILITIES FOR FEDERAL AGENCIES

To further promote access to Japanese STI, several witnesses recommended expanded funding and responsibilities for Federal agencies as follows:

Increased funding for NTIS to expand their work;[92]

Increased staff of technically trained people at the U.S. embassy in Tokyo and consular offices, with responsibility for analyzing and evaluating Japanese technology;[93]

Increased support through NSF and other agencies for international travel as well as technical exchange programs for U.S. engineers and scientists;[94]

Increased support for bilateral scientific and technical agreement as well as expanded efforts by participating Federal agencies and NTIS to publicize and disseminate the documentation produced through these agreements to universities, industry, and the general public.[95]

6. NEED FOR A NATIONAL INFORMATION POLICY

One witness addressed a broader issue related to the Federal role in promoting the availability of Japanese STI—the lack of a national information policy. Although some Federal agencies have strong, technical information programs, there is no agency in the

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lished translations. During the late 1950's and 1960's, the Center received operating subsidies from NSF; however, in 1972, NSF removed that support requiring a 50 percent cut in the Center's staff and operations. Today the Center is supported by fees and subscriptions to its monthly index. From prepared statement of William S. Budington for the Hearings, p. 377-378.

[88] Prepared statement of Michael Majcher for the Hearings, p. 334.

[89] Prepared statement of William S. Budington for the Hearings, p. 374-375.

[90] Prepared statement of John Alic for the Hearings, p. 274.

[91] Prepared statement of Robert W. Gibson for the Hearings, p. 352.

[92] Prepared statement of James Bartholomew for the Hearings, p. 95; and prepared statement of John Alic for the Hearings, p. 273.

[93] Prepared statement of John Alic for the Hearings, p. 274.

[94] Prepared statement of John Alic for the Hearings, p. 274.

[95] Prepared statement of Justin Bloom for the Hearings, p. 17-18.

Federal government with clearly assigned responsibility for overall policy regarding scientific and technical information. By contrast, Japan, France, and West Germany have policies to establish national information systems. The witness recommended that: [96]

> * * * the U.S. government can act to improve our access to scientific and technical information from international sources, and in particular from Japan. This would require that a national policy be adopted to encourage the U.S. information community in its efforts, and to foster international cooperation between U.S. organizations engaged in information activities and their counterparts in other countries.

C. Legislative Activity During 1984

In response to the concerns expressed by experts, the House Committee on Science and Technology proposed legislation to increase the availability of Japanese STI in the United States. The report accompanying the National Bureau of Standards' FY84 and FY85 authorization bill (H.R. 5172) recommended an additional $750,000 to the Administration's FY85 budget request of $3.371 million for the Office of Productivity, Technology, and Innovation (OPTI) in the Commerce Department. These additional funds would be used to increase the availability of Japanese science and engineering literature. To achieve this goal, the bill authorized OPTI to fund grants or contracts with private, nonprofit, and educational organizations, and to coordinate with other government organizations. In addition, the bill stated that the Director, staff, and facilities of NTIS be utilized for all or part of this effort. [97]

As passed by the House on May 2, 1984, Section 203 of H.R. 5172 directed that $750,000 of the $3.871 million authorized for OPTI be spent on increasing the availability of Japanese STI; Section 205 of H.R. 5172 directed that $500,000 of the $4.121 million authorized for OPTI be spent on increasing the availability of Japanese STI.

On September 21, 1984, the Senate passed H.R. 5172 with an amendment in the nature of a substitute. The bill authorized $3.371 for OPTI; of that amount, OPTI was directed to spend $500,000 on Japanese STI. The House agreed to the Senate changes on October 4, 1984. On October 30, 1984, H.R. 5172 was vetoed by the President. OPTI did not receive additional funding for Japanese STI in the FY85 appropriations.

In the report accompanying NSF's FY85 authorization bill (H.R. 4974), the House Committee on Science and Technology directed NSF—in consultation with other agencies such as OPTI—to submit to the Congress by February 1985, a report including: [98]

> An analysis of U.S. capabilities with regard to translating Japanese STI, in the Federal agencies and the private sector;

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[96] Prepared statement of James V. Seals for the Hearings, p. 366-367.

[97] U.S. Congress. House. Committee on Science and Technology. Authorizing Appropriations to the National Bureau of Standards for Fiscal Years 1984 and 1985. Report to Accompany H.R. 5172. House Report No. 98-650, 98th Cong., 2d Sess. Washington, U.S. Govt. Print. Off., 1984. p. 18.

[98] U.S. Congress. House. Committee on Science and Technology. Authorizing Appropriations to the National Science Foundation. Report to Accompany H.R. 4974. House Report No. 98-642, 98th Cong., 2d Sess. Washington, U.S. Govt. Print. Off., 1984. p. 23.

Suggestions for improving the effectiveness of Federal efforts in Japanese literature translation, including the consideration of the dissemination and production of information, as well as possible duplication of effort; and

Options for reducing translation barriers, such as national and international copyright laws, manpower, and funding shortages, and Japanese scientific and technical information policies.

VI. CONCLUSION

During the next decade, Japanese advances in science and technology and emphasis on R&D spending are likely to continue. To remain competitive in high technology products, observers in both the public and private sectors have called for accelerated efforts to monitor Japanese scientific and technological developments and to acquire related literature. Most participants at the MIT Workshop and at the hearings agreed that there exists an immediate need for greater access to Japanese STI; to achieve this objective, problems associated with accessing this data must be resolved. Many of these experts claimed that current efforts by Federal agencies, universities, and private organizations are inadequate to overcome existing barriers to acquiring, translating, and disseminating Japanese STI.

The witnesses at the hearings recommended several options—such as support for translation services and library collections, and increased funding for NTIS—from which the Federal government can choose to assist public and private sector organizations in accessing Japanese STI. In particular, experts emphasized the need for Federal assistance in the area of Japanese language instruction. However, before any steps are taken to increase the Federal role, it may be important to assess the current uses of Japanese STI as well as the nature of the demand for this data. Such studies would supply more detailed information necessary for sound policy-making in the future.

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